

LETTER / *Forensic medicine*

Post-mortem computed tomography in a case of suicide by air embolism

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KEYWORDS

Virtual autopsy;
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Over the last 10 years, forensic medicine has benefited from cross sectional imaging and the development of the virtual autopsy. The study of post-mortem gas effusion is a determining element in the understanding of the causes of death, in particular in cases of air embolism. The authors report a rare case of suicide by air embolism and describe the contribution of the post-mortem CT scan.

Case report

An 82-year-old man was hospitalised for COLD decompensation. One morning, after 2 weeks of hospitalisation, the medical personnel discovered the patient's body. His peripheral venous catheter was directly connected to the wall oxygen. Death was pronounced in spite of attempts to resuscitate the patient. A CT examination was carried out not more than 12 hours after the assumed time of death. The acquisition was obtained on a Siemens Definition 64 slice bi-tube scanner (Siemens, Erlangen, Germany).

The body was autopsied the next day, 26 hours after the supposed time of death, according to the classic protocol techniques, without immersion of the cadaver.

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CT results

The authors found very abundant intravascular gas within the portal, arterial and venous system. In the arterial system, they observed complete pneumatisation of the supra-aortic trunks (Fig. 1) and Willis polygon.

The systemic venous and portal gas was also diffuse. At the extravascular level, diffuse subcutaneous emphysema was noted as well as a pneumomediastinum, a right pneumothorax, a pneumoperitonium and a retro-pneumoperitonium (Fig. 2).

The pulmonary parenchyma presented COLD-related emphysematous lesions of the centro-lobular type.

Autopsy results

The autopsy mainly found:

- generalised subcutaneous emphysema discordant with the absence of signs of putrefaction;
- an acute pulmonary oedema;
- signs of asphyxia (very marked petechiae with cyanosis of the face);

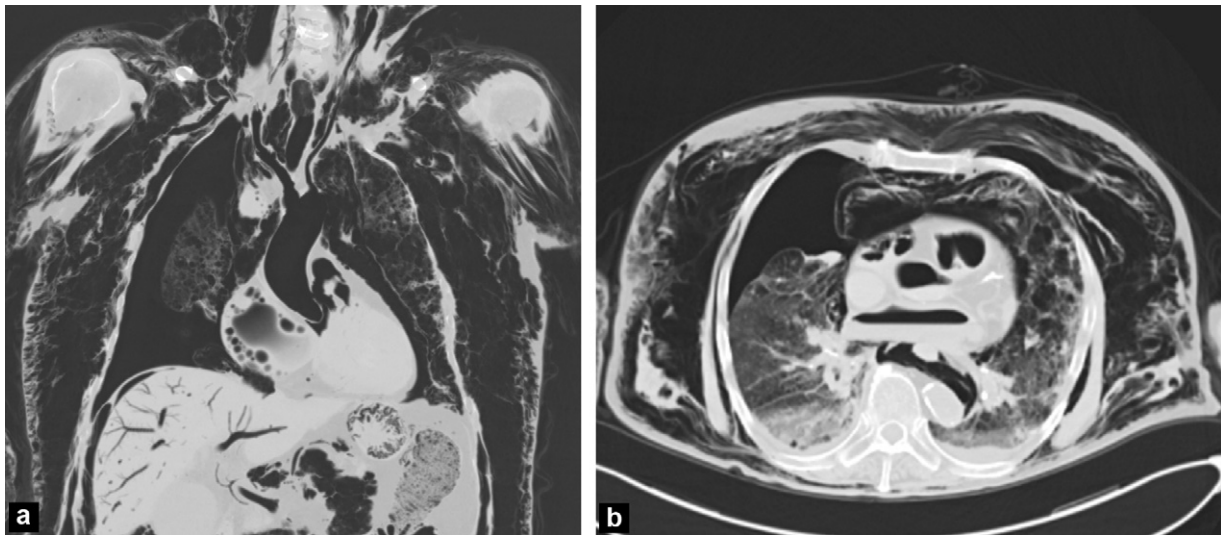


Figure 1. Intra-arterial gas within the left cavities and the supra-aortic trunks. Right pneumothorax and pneumomediastinum: a: minimum-intensity-projection (MinIP) oblique coronal reconstruction; b: multiplanar (MPR) axial reconstruction.

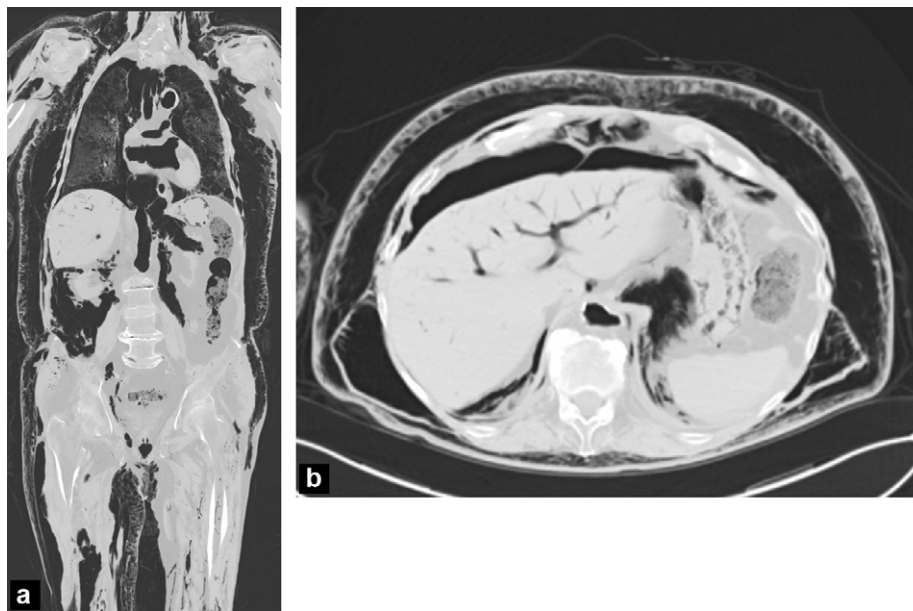


Figure 2. Diffuse subcutaneous emphysema, pneumoperitonium: a: minimum-intensity-projection (MinIP) coronal reconstruction; b: multiplanar (MPR) axial reconstruction.

- the absence of permeable foramen ovale;
- significant intravascular gas effusion was not mentioned.

Discussion

According to the data in the literature [1], comparison of the autopsy results with those of the CT scan reveal the superiority of the latter in the detection of intravascular effusion. The scanner also can be used to specify the pathological mechanism. In fact, post-mortem gas effusions are usually related to putrefaction, attempts at resuscitation and decompression accidents. These different causes may add up, as the authors have described in the animal [2].

In this patient, the early CT scan limits the presence of intra-arterial putrefaction gas [2]. The presence of intra-arterial gas is therefore, in this case, most likely related to a paradoxical embolism [3]. The main cause of paradoxical embolism described is the right/left shunt via a permeable foramen ovale [4]. This hypothesis was eliminated by the autopsy. The other mechanisms mentioned are forcing of the pulmonary capillary filter or the opening of intrapulmonary right-left shunts [5]. The existence of these intrapulmonary shunts is debatable: they were initially detected by experimental studies on human lungs [6]. In this study, the inert spheres injected in the pulmonary arteries were found on the pulmonary venous side. These intrapulmonary shunts would be more developed in COLD patients [7]. The hypothesis of exceeding the capacities of the pulmonary filter may also be considered [5,8] in this patient exposed to a high flow.

Several mechanisms may account for the origin of the extravascular gas:

- a direct subcutaneous injection of gas by the venous breach in the catheter under pressure;
- the pneumothorax may be consecutive to the gasps, especially since the lung is diseased;
- a pneumothorax or subcutaneous emphysema related to the thoracic compressions, although the absence of rib fractures does not favour this;
- the diffusion of dissolved intravascular gas due to an increase in the partial pressure of oxygen.

Finally, the associated presence of emphysema, pneumothorax, pneumomediastinum, pneumoperitonium and retro-pneumoperitonium may be accounted for by a

communication between these different compartments, as described by Maunder et al. [9].

Conclusion

The whole-body CT scan is the choice examination after a death by air embolism. Provided that it is carried out early, it provides a simple account of intra and extravascular gas effusion. The possible diffusion of gas from the venous compartment to the arterial compartment, as well as between the different extravascular compartments, has to be known in order to back up the causes of death.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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